PROPOSAL TO CONDUCT EXPERIMENTS IN THE WESTERN ATLANTIC NORTHEAST DISTANT WATERS (GRAND BANKS) AREA TO EVALUATE SEA TURTLE MITIGATION MEASURES

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
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PROPOSED 2003 EXPERIMENTAL DESIGN FOR THE GRAND BANKS (NED)

NOAA Fisheries proposes to conduct scientific research in consultation and cooperation with the commercial pelagic longline fleet in the Western North Atlantic. The objective of the research is to develop and evaluate the efficacy of new technologies and changes in fishing practices in order to reduce the incidental take and mortality of endangered and threatened sea turtle species by pelagic longline gear. This will be the third and final year of the planned research and is scheduled to commence by June 1, 2003 or no later than July 1, 2003. At the completion of the third year of research, management recommendations will be provided to NOAA fisheries managers. NOAA Fisheries is seeking authorization of this research through application of an ESA section 10 research and enhancement permit. The proposed research will utilize commercial fishing vessels as research platforms in the Northeast Distant (NED) statistical sampling area (Figure 1). Participating pelagic longline vessels that fish the NED must carry observers, and they must fish their gear in a specified, pre-determined manner designed to test one or more variables affecting sea turtle bycatch.

Five potential mitigation techniques were evaluated during 687 research sets in 2001 and 2002. Data were collected to evaluate the effectiveness of the mitigation measures and to investigate variables that effect sea turtle interaction rates with pelagic longline gear. The results of this research indicate that a significant reduction in loggerhead catch may be achieved by reducing daylight soak time. 18/0 circle hooks and mackerel bait were found to significantly reduce both loggerhead and leatherback sea turtle interactions when compared with industry standard J hooks and squid bait. Also, circle hooks significantly reduced the rate of hook ingestion by the loggerheads, reducing the post-hooking mortality associated with the interactions. The combination of 18/0 circle hooks and mackerel bait was found to be the most efficient mitigation measure for both loggerhead and leatherback turtles. Mackerel bait was found to be more efficient for swordfish than squid bait and circle hooks were more efficient for tuna than J hooks. (Reports available online at http://www.mslabs.noaa.gov/mslabs/docs/pubs.html)

Below is a summary of the proposed 2003 NED experimental design which includes sample sizes required to evaluate proposed mitigation treatments and estimated sea turtle takes. The mitigation measures proposed are highly likely to reduce interactions by at least 50%.

Based on the deliberations and recommendations of the ad hoc pelagic longline gear working group the objectives for 2003 experiments in the NED are:

1. Remove fishing tactics restrictions from vessels and:
   - Re-evaluate the effect of non-offset 18/0 circle hooks with squid bait on turtle and swordfish cpue.
   - Re-evaluate the effect 10^{o} offset 18/0 circle hooks with mackerel bait on turtle and swordfish cpue.

2. Evaluate the effect of 20/0 circle hooks with mackerel bait on turtle and swordfish cpue.

3. Evaluate the effect of 10/0 Mustad #9202SR Japanese tuna hooks with mackerel bait on turtle and swordfish cpue.

4. For tuna directed sets, evaluate the effect of 18/0 circle hook with squid on turtle and tuna cpue.

Sample size required to detect 50% reduction in leatherback and loggerhead turtle CPUE using one sided hypothesis

SWORDFISH DIRECTED SETS

SET ONE

Control	A	25º-30º offset 9/0 J hook w/squid bait	87,409 hooks
Treatment	B	0º offset 18/0 circle hook w/squid bait	87,409 hooks

SET TWO

Treatment	C	10º offset 18/0 circle hook w/mackerel bait	87,409 hooks
Treatment	D	0° offset 10/0 Jtuna hook w/mackerel bait	87,409 hooks

SET THREE

Treatment	C	10° offset 18/0 circle hook w/mackerel bait	40,500 hooks
Treatment	E	10° offset 20/0 circle hook w/mackerel bait	40,500 hooks
		Total (All Swordfish Sets)	**430,636 hooks**

TUNA DIRECTED SETS (Loggerheads only)

Control	A	10° offset 16/0 circle hook w/squid bait	47,757 hooks
Treatment	B	0° offset 18/0 circle hook w/squid bait	47,757 hooks
		Total (All Tuna Sets)	**95,514 hooks**

Experimental Fishing Design Requirements

SWORDFISH DIRECTED SETS (Ten vessels starting first trip with 10/0 Jtuna hook Treatment)

Alternate Sets ONE and TWO

SET ONE – Alternate control A and treatment B with either 3 or 5 hooks between floats, first hook immediately adjacent to each float and equal distance between all hooks and next float.

SET TWO – Alternate treatment C, and treatment D with either 3 or 5 hooks between floats, first hook immediately adjacent to each float and equal distance between all hooks and next float.

SWORDISH DIRECTED SETS (Three vessels starting first trip with both 20/0 circle and 10/0 Jtuna hook treatments)

SET TWO – Alternate treatment C, and treatment D with either 3 or 5 hooks between floats, first hook immediately adjacent to each float and equal distance between all hooks and next float.

SET THREE – Alternate treatment C, and treatment E with either 3 or 5 hooks between floats, first hook immediately adjacent to each float and equal distance between all hooks and next float.

After the first trip a decision, based on the data and information collected and consultation with the ad hoc advisory group, will be made between whether to continue with either the 20/0 circle or the 10/0 Japanese tuna hook treatments. After the first trip all vessels will alternate SET ONE and either SET TWO or SET THREE or fish only treatment C on alternating sets.

Each vessel must alternate the set configurations listed above. For every set the vessel will deploy the gear with 3 or 5 hooks between each float, one placed directly adjacent to each float and the other hooks placed between the floats equal distance from each other. Set (ONE) will alternate control J hooks baited with squid and 0° offset 18/0 circle hooks baited with squid. Set (TWO) will alternate 10° 18/0 circle hooks baited with mackerel and 10/0 Mustad # 9202SR Japanese tuna hook baited with mackerel. Set (THREE) will alternate 10° offset 18/0 circle hooks baited with mackerel and 10° offset 20/0 circle hook baited with mackerel.

TUNA DIRECTED SETS

Each vessel targeting tuna will alternate 10° offset 16/0 circle hooks baited with squid bait and 0° offset 18/0 circle hooks baited with squid with an odd number of hooks between floats and equal distance between all hooks and next float.

Gear standardization requirements:

1. Branch lines must be at least 110% of the float line length.
2. Hook spacing must be consistent within a set.
3. Light sticks must be used on every leader for swordfish directed sets. Used light sticks may be used one additional set, used light sticks must be used in a manner that mixes up the used and new light sticks so that there is no bias between control and treatment hooks.
4. Light stick color must be uniform within a set.
5. Gangion length must be uniform within a set.
6. Float (drop lines) must be uniform within a set.
7. Hook fished immediately adjacent to each float.

8. Must fish either 3 or 5 hooks between floats (for tuna sets must fish odd # of hooks between floats).
9. Leaded swivels must be used on every leader and must be 2 to 3 fathoms from the hook.
10. Squid bait used should be illex squid between 150 and 300 grams in weight.
11. Mackerel bait should be Boston mackerel between 200 and 500 grams in weight.
12. Baiting technique (squid and mackerel) must be consistent within a set.
13. Baiting techniques:

- Vessels may choose the baiting technique for squid sets.
- For mackerel sets each vessel will alternate between a single hooking technique and a threading technique on every other mackerel set except for the 10/0 Japanese tuna hook which will be baited with a single hooking technique only.

14. Control hooks will be supplied by each vessel and must be one of the following hook types:

Swordfish	**Tuna**
Mustad 9/0 # 7698 RD	Mustad 16/0 #39966
LP-SW 9/0	LP 16/0 circle
Eagle Claw 9/0 # 9016	
Mustad 9/0 # 76801	

15. All leaders or snaps must be color coded in a manner that allows positive identification of hook type used.

Observers will collect a suite of data on forms generated by the SEFSC Pelagic Longline Observer Program including the Longline Gear Configuration Log, the Longline Haul Log, and the Individual Animal Log, and the Sea Turtle Life History Form (Appendix I). Observers will record the number of swordfish, tuna, and turtles hooked on each hook and bait type, the time, location, and water temperature at which each section of gear is set and hauled, and the time, location, and water temperature at which each turtle is hauled. Participating captains, crews, and observers will follow NOAA guidelines and permit requirements for handling marine turtles hooked or entangled on longline gear. Specific training on handling marine turtles hooked or entangled will be provided by NMFS qualified personnel at observer and captain training sessions prior to initiation of experiments. Turtles hooked or entangled will be brought on board using dip nets if size permits and all gear removed following recommended procedures. For turtles that cannot be brought aboard, gear will be removed using line cutter and de-hooker prototypes supplied by NMFS to each vessel. Prototype line cutters and de-hookers will be evaluated by crews and observers and information on performance provided to NMFS. All live turtles brought aboard will be measured, tagged with PIT and standard flipper tags, and released. Turtles that appear stressed will be maintained onboard and given the opportunity to revive before release. Up to 20 loggerhead turtles may be outfitted with conventional satellite tags to study the behavior and movements of pelagic stage turtles. An additional number of turtles (up to 10) may be outfitted with archival pop-up satellite tags (PSAT) for the purpose of evaluating their effectiveness for the study of turtle life history, and to investigate the effectiveness of the technique for collecting information on post hooking survival.

The estimates of catch rates per hook of control and treatment groups will be computed from the sample data. Using these estimates, a one-tailed hypothesis test will be conducted to test if the true catch rate for the treatment group is lower than that of the control group. Since the sample proportions are estimated from a large number of hooks, a test based on asymptotic normality to compare the two binomial proportions will be used here at a pre-specified level of significance. A confidence interval on the difference in the true proportions will also be computed. The Fisher's exact test and the likelihood ratio test will be performed as well and examined. Statistical analysis will include descriptive statistics, confidence intervals and hypothesis testing procedures on a single and multiple rates and proportions, measures of correlations and associations, generalized linear modeling (logistic and Poisson regression, in particular) and other categorical analytical approaches as deemed appropriate.

Estimated Turtle Takes

SWORDFISH DIRECTED SETS

The estimated loggerhead and leatherback turtle takes for the swordfish directed sets are precautionary and based on the loggerhead cpue rates for 2001 and leatherback cpue for 2002 experiments. It is anticipated that the required sample size of 506 swordfish directed sets (430,636 hooks) will result in an estimated take of 159 loggerhead turtles and 127 leatherback turtles. These rates assume that; loggerhead cpue for 2003 will be similar to 2001, leatherback turtle cpue will be similar to 2002, and that 18/0 circle hook treatment effects for 2003 will be similar to 2002. It is assumed in this estimate the 20/0 circle hook and 11/0 J hook treatments will not reduce turtle takes over the 18/0 circle hooks and 9/0 J hooks, respectively.

TUNA DIRECTED SETS

The estimated loggerhead and leatherback turtle takes for the tuna directed sets are based on 2001 loggerhead cpue rates and that turtle cpue rates for 16/0 circle hooks are similar to control J hooks (Bolten, et. al. 2002). It is anticipated that the required sample size of 112 sets (95,514 hooks) will result in a take of 43 loggerhead turtles and 33 leatherback turtles. The leatherback turtle take estimate assumes the take rate for 16/0 circle hooks will be similar to the 18/0 circle hook.

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